

A First Course on Kinetics and Reaction Engineering

Unit 4. Lesson Plan

Before Class

- Provide the redacted slides to the students and tell them to bring them to class
- Provide the students with the handouts for activity 4.1 and tell them to bring them to class, or print out sufficient copies and bring them to class to pass out

During Class

- Introduce today's topic and where it fits in the course (Slides 1 and 2)
- Review of Unit 4 (5 to 10 minutes)
 - Slide 3: Go over different definitions for rates, emphasize the relationship between generalized rate and rate with respect to a species and how to convert rate with respect to one species to rate with respect to a different species; note that the cell growth rates use mass units, not moles
 - Slide 4: Point out that in most cases the rate expression does not come from the stoichiometry, go through steps in process for generating a rate expression (note that each step will be covered in later units), review Arrhenius expression (note that A_j is sometimes used instead of k_{0j} for the pre-exponential factor)
- Ask whether the students have any questions from their pre-class preparation and answer them
 - Slide 5
- Learning Activity (~20 minutes)
 - Slide 6:
 - Divide the class into thirds and tell all the students in the first third to complete handout A, all those in the second third to complete handout B and the rest to complete handout C. Give them ~5 minutes to do so
 - Tell one person from each third to go to the chalkboard and write their answers; if others in that third disagree, they should work through and come to a consensus
 - Slide 7
 - Point out that the problem was the same in all three cases except for the way the reaction was written
 - Go through and compare the results as a class - only the extents and generalized rates should cause differences
 - Conclude that as long as you are consistent throughout the solution of a problem, you will get a correct answer, but if you change mid-way through a problem solution, your result may be wrong
- Learning Activity (20 minutes)
 - Slide 8
 - Keep the class divided into thirds, and within each third, form them into groups of three

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- Assign the first problem to the first third, the second problem to the second third and the third problem to the others and give them 5 to 10 minutes to set the problem up; ***tell them that each person should make a copy of the problem set up***
- Slide 9
 - Reform the class into groups of three where each group has one person who set up the first problem, one who set up the second and one who set up the third.
 - Tell them to each explain their set up to the other two people in the group; answer question as they arise
- Slide 10: Put what they just worked on in context, and tell them what's coming next class

After Class

- Provide the complete slides to the students.
- Either assign them to perform the calculations in either or both of the problems; or post the solutions provided with the handout and tell them to check their work from in class and make sure it was correct.